REMARKS

The present amendment is prepared in accordance with the new requirements of 37 C.F.R. § 1.121. The clean copy of the claims is provided above. The marked-up copy of the claims is attached on separate sheets. In the marked-up version, inserted material is underlined and deleted material has a line therethrough.

Applicants appreciate the thoroughness with which the Examiner has examined the above-identified application. Reconsideration is requested in view of the amendments above and the remarks below.

Applicants note that claims 7 and 14 are objected to as being dependent upon a rejected base claim but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims. Applicants have rewritten claims 7 and 14 as independent claims 16 and 17, respectively, and it is respectfully submitted that these claims are now properly allowable. Support for the new independent claims may be found, for example, on page 10, the paragraph beginning at line 22.

Before we review the rejections of the other claims, it may be helpful set forth Applicants' invention as now amended.

Applicants have amended the claims to further clarify the invention and highlight the differences between the invention and the cited prior art.

Accordingly, independent claims 1 and 8 have been amended to clarify that the electronic component assembly which comprises at least two components is joined by a plurality of solder interconnections in a row-by-row array and each row is cut and severed row-by-row. Basis for the amendments may be found, for example, on page 6, the paragraph beginning at line 6, where the solder balls 13 as shown in Fig. 1 are typically in a row-by-row array and as shown in the figure, is a 3 x 3 array containing nine (9) solder ball interconnections. It is further noted therein that the arrays could be 25 x 25 or higher. As shown in Figs. 2A-2D, a cross-sectional view of the electronic component of Fig. 1 is shown and a printed board substrate 11 is shown having a chip 12 electrically connected thereto by solder balls 13 in a 3 x 3 array. As discussed on page 7, beginning at line 1, a cutting device 15 is positioned over the printed circuit board and is moved forward in the direction of the arrow toward the first solder ball row 13a. The row of solder balls 13a is severed and then the next rows of solder balls 13b and 13c are each sequentially severed so that the printed circuit board 11 can now be removed from the chip 12. It is respectfully submitted that the invention as now claimed is patentably different and distinct from the prior art cited by the Examiner.

Claims 1, 4, 8, 11 and 15 have been rejected under 35 USC 102(b) as being anticipated by Spigarelli et al. (U.S. Patent No. 5,220,147). The Examiner contends that Spigarelli et al. teach a method and apparatus for separating solder components from a board (col. 1, lines 11-23), wherein the assembly is held and the solder has a

thickness, a cutting blade having a thickness less than the thickness of the solder is heated, forced against the connection and advanced thus severing the connection. This process is repeated as necessary citing col. 3, lines 3-25. The Examiner further notes that the component removed by this process can be any component and the component assembly can be separated by any other means and still maintain the same structure, citing claims 1 and 5-7. It is respectfully submitted that the claims are properly allowable over Spigarelli et al.

Spigarelli et al. is directed to a contact heater for removing components from a printed circuit board. A heating blade and heat shield are provided to provide enhanced heating accuracy and to the protect adjacent areas and components from damaging thermal hot air. Hot air exits the assembly through outlets and is directed toward the heating blade and when the desired heating blade temperature is reached, the heat blade is applied to the area to be heated. A heat shield is also attached to the contact heater and protects adjacent components from the hot air.

It is clear from the disclosure in Spigarelli et al. that a row-by-row array of solder interconnections is not severed one row at a time and which adjacent rows are sequentially severed one row at a time as shown and claimed in Applicants' invention. Spigarelli et al. in all the figures shows heating of a solder pad to reflow the solder pad to make an interconnection. See column 2, the paragraph beginning at line 31. Similarly, see column 3, the paragraph beginning at line 3. See also column 4, the paragraph beginning at line 12, where the distal end 216 of heating

blade 202 having reached the desired temperature is moved into contact with solder pad 222.

It is respectfully submitted that Spigarelli et al. does not disclose nor teach Applicants' invention as now claimed and it is respectfully submitted that the claims are properly allowable over Spigarelli et al.

Claims 1, 4-6, 8, 11-13 and 15 have been rejected under 35 USC 102(b) as being anticipated by Bryant et al. (U.S. Patent No. 5,938,882). Bryant et al. is cited as teaching a method and apparatus for separating solder (epoxied) components from a board with a soldering tool citing col. 1, lines 14-20 and lines 36-45. The assembly is held and the solder has a thickness, a cutting blade edge having a thickness less than the thickness of the solder (citing Figs. 3 and 4) is heated, forced against the connection and advanced thus severing the connection. The process is repeated as necessary citing col. 2, lines 5-38, col. 3, lines 25-30 and col. 4, lines 21-36. A vacuum is employed to remove the cut solder (epoxy) citing col. 5, lines 15-60. The Examiner notes that the device is hand held and it can move in any direction relative to the solder and the component removed by this process can be any component and the component assembly can be separated by any other means and still maintain the same structure for reuse, citing col. 5, line 61 through col. 6, line 2 and claims 1-3. It is respectfully submitted that the claims are properly allowable over Bryant et al.

Bryant et al. is directed to a method of removing an epoxy bonded microelectronic component from a substrate and includes the steps of heating a removal tool comprising a blade portion. The heated blade portion engages against the cured epoxy positioned around the edge of the component and the epoxy is melted and removed. A screwdriver receiving tip can also be attached to the removal tool for heating the screwdriver receiving tip of the screwdriver shaft so any screw can be removed by heating. It is respectfully submitted that it is clear that Bryant et al. does not disclose nor teach a method or apparatus as taught by Applicants whereby a row-by-row array of solder interconnections is sequentially removed row-by-row as now claimed by Applicants. Applicants' method and apparatus does not remove screws holding an electronic component to an assembly nor does it move around the periphery of an electronic component to melt cured epoxy which is removed by the tool. It is respectfully submitted therefore that Applicants' claims as now claimed are properly allowable over Bryant et al.

Claims 2, 3, 9 and 10 have been rejected under 35 USC 103(a) as being unpatentable over Bryant et al. (U.S. Patent No. 5,938,882) in view of Muramatsu et al. (U.S. Patent No. 5,427,641). Bryant et al. is cited as noted above and the Examiner acknowledges that there is no disclosure of a wire-cutting element in Bryant et al. Muramatsu et al. is cited as teaching a wire cutting means (7) for removal of electronic components from a substrate, citing col. 3, lines 30-45 and

col. 6, lines 44-68 such that they can be used (bonded) later, citing claim 9. Miramatsu et al. claims 2, 3 and 9 are also cited.

The Examiner concludes it would have been obvious to one of ordinary skill in the art at the time of the invention that the fine cutting wires are known alternatives for cutting blades which would facilitate non-destructive removal of components (Bryant, col. 1, lines 21-26) without damaging neighboring components or creating excess debris in a cost-effective manner (Bryant, col. 1, lines 36-49) It is respectfully submitted that the claims are properly allowable over Bryant et al. in view of Miramatsu et al.

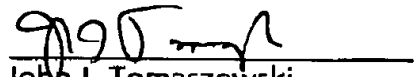
Bryant et al. does not disclose nor teach Applicants' invention as discussed above, and it is respectfully submitted that Muramatsu et al. does not supply the deficiencies of Bryant et al. Muramatsu et al. is directed to a tape carrier for electronic components and a heated wire is utilized to sever adhesive electrical tape by melting. There is no disclosure in Muramatsu et al. to sever solder interconnections row-by-row as now claimed by Applicants. It is thus respectfully submitted that Muramatsu et al. does not supply the deficiencies of Bryant et al. and the claims are properly allowable over this combination of references.

Applicants note that a number of patents have been made of record but not relied upon and is considered pertinent to Applicants' disclosure. Specifically, Hyun (U.S. Patent No. 4,896,019); Hembree (U.S. Patent No. 6,267,650); Oglesby et al. (U.S. Patent No. 4,785,793); Michel (U.S. Patent No. 3,903,581); and Waller

et al. (U.S. Patent No. 5,229,575) have been reviewed and it is respectfully submitted that they do not render Applicants' invention unpatentable whether taken singly or in any proper combination thereof.

It is respectfully submitted that the application has now been brought into a condition where allowance of the case is proper. Reconsideration and issuance of a Notice of Allowance are respectfully solicited. Should the Examiner not find the claims to be allowable, Applicants' attorney respectfully requests that the Examiner call the undersigned to clarify any issue and/or to place the case in condition for allowance.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims

Claims 7 and 14 have been canceled and new claims 16 and 17 have been added.

Claims 1 and 8 have been amended as follows.

1. (Amended) A method for separating electronic components joined by a row-by-row array of solder interconnections comprising the steps of:

supplying an electronic component assembly having at least two components joined by a plurality of solder interconnections in a row-by-row array and having a first thickness;

providing a cutting element having a thickness less than the first thickness of the solder interconnections;

heating the cutting element to a temperature sufficient to melt the solder at the point of contact when the cutting element is in contact with and forced against the solder interconnections;

positioning the heated cutting element adjacent one of the rows of the solder interconnections;

applying a force to advance the heated cutting element through the row of solder interconnections whereby the heated cutting element engages and

cuts through the row of solder interconnections and severs the row of solder interconnections;

continuing the above steps for the remaining rows of solder interconnections to cut and sever all the rows of solder interconnections; and

separating the two components.

8. (Amended) An apparatus for separating electronic components joined by a row-by-row array of solder interconnections comprising:

securing means to hold an electronic assembly having at least two components joined by a plurality of solder interconnections in a row-by-row array and having a first thickness;

a cutting element having a thickness less than the thickness of the solder interconnections;

a heater to heat the cutting element to a temperature sufficient to melt the solder at the point of contact when the cutting element is contacted with and forced forward against a row of the solder interconnections;

positioning means to position the heated cutting element adjacent one of the rows of solder interconnections;

advancing means to force the heated cutting element against the row of solder interconnections and through the row of solder interconnections whereby

the heated cutting element cuts and severs the row of solder interconnections; and

separating means to separate the two components when all the rows of solder interconnections have been cut and severed row-by-row by the heated cutting element.